

part than it does elsewhere in Great Britain or abroad, and the differences of opinion that from the first existed between Koch and those Scottish investigators whose material was obtained in Edinburgh are thus, in all probability, accounted for. This is a matter of great importance and continues to receive attention.

Dr. Cobbett, in summing up, contends that the "bovine bacillus" is less virulent than the "human bacillus" for man, man in this respect differing from all other animals, "for, with the exception of the apes and monkeys, which are equally susceptible, and the dog, which is equally resistant to either type, all other species, so far as is known, are more severely affected with the bovine than with the human bacillus."

Finally, Dr. Cobbett concludes (1) that the importance of tuberculosis is not to be measured only by the deaths caused—above 50,000 per annum in England and Wales alone, mostly "in the prime of life or only a little earlier"—but that, "in addition to these deaths, tuberculosis produces a great number of cripples"; (2) that during the last fifty years "the number of deaths caused each year by tuberculosis has diminished steadily and substantially, and the ratio of deaths to population has fallen by more than 50 per cent.," that it is still declining rapidly "and at an ever-increasing velocity."

In a series of appendices a number of interesting details concerning recent investigations are given. Of these one of the most important is the persistence of tubercle bacilli of human type in the tubules of the cow's udder once it has made its way, and gained a footing, there. This, with an account of the general dissemination of tubercle bacilli after subcutaneous injection, indicates the danger involved in the attempt to immunise milch cows against tuberculosis with living tubercle bacilli. A brief account of the later studies of the types of tubercle bacilli found in the lesions of bone and joint tuberculosis, by which Dr. Cobbett has been led to the conclusion that the percentage of bovine infections is considerably greater than set out earlier in the book, the percentage of bovine infections in England being 14.7 and in Scotland 29.6, is of considerable interest in that here we have a key to the value of the work before us—the extreme impartiality and open-mindedness of the author.

All who are interested in tuberculosis will be well repaid by a careful study—not merely a perusal—of this interesting work, a study rendered far easier by the numerous excellent photographs illustrating points to which the author wishes to direct special attention.

MATHEMATICAL PUZZLES.

Amusements in Mathematics. By H. E. Dudeney. Pp. viii + 258. (London: T. Nelson and Sons, Ltd.) Price 3s. 6d. net.

MR. DUDENEY is famous as a composer of puzzles of a semi-mathematical character, and for some years questions by

him of this kind have appeared regularly in several English periodicals. He has now collected a large number of them, added a few new ones, and published the whole in book-form classified under various heads. The questions, more than four hundred in number, range over so wide a field that it is difficult to describe them succinctly, but usually they consist of brief statements, put in a picturesque form, of problems that might conceivably occur. Of these conundrums, some are variations of familiar puzzles, others are new, some are easy, others difficult, but, broadly speaking, all are interesting, and none can be answered without care and thought. In a few cases the point of the problem depends on the wording—a device open to criticism, though one which, in his preface, Mr. Dudeney explicitly defends. The solutions are given separately in the latter part of the book, and no one acquainted with Mr. Dudeney's reputation will need the assurance that they are ingenious and suggestive.

The author—wisely for his purpose—generally avoids lengthy discussions, but the permanent value of the work would have been increased had references to authorities who had treated questions analogous to those submitted been given more freely. For instance, the problem of arranging the twelve members of a bridge club for eleven days so that no two members play together as partners more than once and each member meets every other member as opponent twice is propounded, and Mr. Dudeney gives the bare answer; but there is no reference to Moore's paper of 1896 where the question for 4m players is discussed and the theory set out. Again, one "compass" construction is proposed, and the solution of the particular question is given; but a reference to Mascheroni's work of 1795 would have shown that there is a theory of the subject and put the reader on the track of scores of similar problems.

Interspersed in the text are some scholia on problems of particular types, with notes of methods for attacking them. These seem to us the most valuable part of the book, for collections of miscellaneous questions, once read, are not often looked at again; but comments on methods of solution and the past history of problems are of permanent interest. We should have liked to see further discussions of this kind, but with such a feast spread before us it would be ungracious to complain that more has not been given. In one of these scholia there are diagrams of some European labyrinths: Mr. Dudeney says he does not know of any instance of such a figure in an English church, so it may be pointed out that there is one, outlined in marble, on the floor of Ely Cathedral—probably it had not been laid down in 1858, when Trollope wrote his standard account of the subject. In the notes on magic squares there is mention of a transerial or doubly magic square of the eighth order, and it might well have been added that similar squares of higher orders are also known: the formation of such squares is, however, a difficult problem and not to be recommended to non-mathematical readers. In another scholium the digital treatment of

certain number-problems is discussed; we gather that this application is original on Mr. Dudeney's part. Digital properties are but little known to mathematicians, and we hope his example may serve to direct attention to the method: it was freely used by Bidder, the calculating prodigy, and in a certain class of arithmetical problems is of great assistance.

This notice will indicate generally the lines on which the book is written, and on the whole we should say that it is the best miscellaneous collection of the kind with which we are acquainted. The book is profusely illustrated, a marvel of condensation and cheapness, and singularly free from ambiguities and slips. It would be difficult to find a more attractive present for a schoolboy who is interested (as most schoolboys are) in such problems, for wherever he opens it he will find some amusing puzzle which will tax, and in many cases overtax, his ingenuity.

FOSSIL BOTANY.

Fossil Plants: a Text-book for Students of Botany and Geology. Vol. iii., *Pteridospermeae, Cycadofilices, Cordaitales, Cycadophyta.* By Prof. A. C. Seward. Pp. xviii+656. (Cambridge: At the University Press, 1917.) Price 18s. net.

IN the present instalment of Prof. Seward's well-known text-book on fossil plants the interest of the subject may rightly be said to culminate. For this volume deals exclusively with the groups of fossil gymnospermous plants, and here between its covers the reader will find spread out for the first time in full and proper perspective the significant discoveries and results of the last fifteen years. The fossil Gymnosperms include the great central groups of seed-plants, and of these one-third of the book is devoted to a consideration of the Pteridosperms and their attendant Cycadofilices, another to the Cycadophyta, whilst the rest is divided between the Cordaitæ and a long chapter on fossil seeds. This last feature is a most useful digest of a complicated mass of literature and is a service that will be generally appreciated.

Modern advance, particularly as to the status of the Pteridosperms and the Bennettiales (Cycadophyta), has depended primarily on the study of petrifications derived from Britain, France, and North America, whilst the knowledge thus obtained has been reinforced and extended by a critical consideration of impressions from which is gained a sort of twilight picture of these ancient vegetations. Prof. Seward possesses the indispensable qualification in the writer of a book like the present of a practical familiarity in handling both these sources of information—petrifications and impressions—and when, in addition, the task is performed with such evident sobriety and good judgment, the result is a book of the greatest permanent value. It should be added that never before has the subject-matter of fossil botany received such full and connected

treatment, nor could the marshalling of the facts be bettered.

In the treatment of his subject-matter the author, in large degree, lets the facts tell their own story. Whilst the theories of fossil botanists are adequately displayed, the author resists all temptations to speculate in the field of plant phylogeny. Nevertheless, apart from his own relevant researches, a good deal of unpublished matter is brought into this book, especially minor points collected from all quarters, each by itself, perhaps, insufficient to justify separate publication, yet in the aggregate appropriately included in a book like this.

Turning over the pages of this book, it is remarkable how large a share in the establishment of fossil botany has been taken by this country. Following the older period of description under Williamson came a newer epoch of critical re-description, with correlations of members previously scattered. With the momentary exhaustion of the English coal-balls of Palæozoic age, the interest passed to the Bennettiales from the American Jurassic rocks, once more to cross the Atlantic to Scotland, where new forms of great antiquity and interest are now coming to light. It is to be expected later on that a more intensive and scientific exploitation of our own and the world's coal resources will continue to produce a harvest of fossil plants rich enough to give full occupation to palæobotanists, and at the same time still further to elucidate the scheme of evolution of the vegetable kingdom.

In conclusion it is fitting to mention that this volume is dedicated by Prof. Seward to the memory of the late Prof. C. R. Zeiller, who for so many years was attached to the Ecole des Mines at Paris. Zeiller appealed to workers in this country not only by reason of his lofty character and eminence as a fossil botanist, but particularly because he, more than any other, established and promoted cordial solidarity between the ranks of fossil botanists on either side of the Channel. It is largely on this account that the recent severe and deplorable losses which the fraternity of palæobotanists has suffered in France (including, in addition to Zeiller himself, Lignier, Grand'Eury, and the elder Bertrand) have evoked in this country a wide and sympathetic response which only the loss of personal friends can arouse.

OUR BOOKSHELF.

With the French Flying Corps. By C. D. Winslow. Pp. 190. (London: Constable and Co., Ltd., 1917.) Price 3s. 6d. net.

THIS short volume contains the experiences of an American volunteer who joined the French Flying Service, and gives a brief account of the various steps of his training. The book can in no sense be called a scientific work; indeed, the use of technical terms is very loose, as, for instance, the definitions of angle of attack and angle of incidence given on p. 30. Statements such as that on p. 26 to the effect that "when two aeroplanes